

REMARKS

Claims 1 to 38 are currently pending. With this Response, Applicant has amended Claims 3 and 4. The amendments to the claims are expressed in the detailed listing above.

Specification

The specification was objected to because the Abstract included the name of the inventor. Per the Examiner's suggestion, the Applicant has amended the Abstract to not include the name of the inventor. Accordingly, the Applicant requests that the objection to the Abstract be withdrawn.

Claim Rejections - 35 USC § 102

Claims 1-2, 5-17, 28, 33-38 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S.P.N. 6,456,099 to Eldridge et al. ("Eldridge").

Eldridge does not contain each and every element of any of claims 1-2, 5-17, 28, and 33-38. Therefore Eldridge does not anticipate any of those claims, as discussed below.

The Examiner has asserted that Eldridge anticipates claim 1 of the present invention because Eldridge discloses "at least one probe pad (716) for testing of the functional circuitry (col. 1, lines 5-10); and the multiplexing circuitry (708) between the probe pad (716) and the bond pads (717), the multiplexing circuitry (via 708) for multiplexing signals between the probe pad and each of the respective portions (via 713) of the functional circuitry (702), thus allowing the respective portions of functional circuitry to be tested using the probe pad and without any contact of the plurality of bond pads by a probe needle (col. 7, lines 20-27)."

However, a close look at the figures and text of Eldridge indicates that the position and function of anything that may be interpreted to be the claimed “probe pads” is quite different in Eldridge, and thus Eldridge does not teach or disclose the claim 1 limitation of “multiplexing circuitry between the probe pad and the bond pads, the multiplexing circuitry for multiplexing signals between the probe pad and each of the respective portions of the functional circuitry, thus allowing the respective portions of functional circuitry to be tested using the probe pad and without any contact of the plurality of bond pads by a probe needle.”

In Eldridge, “the special contact pads” referred to by the Examiner above, are numbers 713 and 715 in the text and in Figures 7, 8, and 10. The “special contact pads” can be equated to the presently claimed “probe pads” because Eldridge teaches that “special contact pads are used to provide external test patterns to internal circuits and/or to externally monitor results from testing the internal circuits” (Abstract). The bond pads are numbers 716 in the figures and text of Eldridge: “special contact pads 713 and 715 and bond pads 716 may be used to monitor the output...” (Col. 7, ll. 54-55). In Fig. 8 of Eldridge, it is clear that the “special contact pads” are between the functional circuitry (memory 702 and I/O interface 704,705) and multiplexing circuitry 708. The bond pads 716 are at the far right of the figure. Because the bond pads 716 of Eldridge, at the far right, are at the output of the multiplexer, and are connected only to I/O drivers 706, which are internally connected to multiplexing circuitry 708 and special contact pads 715 and 713, *they have no input from any functional circuitry to provide the claimed “probe pads.”* They receive an outputted multiplexed signal from the multiplexer, and do not appear to provide any signal from any functional circuitry that can be multiplexed to a probe pad. This may be why the Examiner appears to have confused them with the “probe pads” of the present invention, whereas they are disclosed as the “bond pads” in Eldridge.

This distinction is amplified when taking into account the teachings of Eldridge. As seen in Applicant’s dependent claims 7 and 8, the claimed probe pad is “substantially the same size as” or “larger than each bond pad.” Eldridge specifically *teaches away from this*

claim limitation. Eldridge teaches “[t]he special contact pads may be smaller than the bond pads so as not to increase the die size due to the special contact pads,” (Abstract) and that “more special test pads may be disposed in integrated circuit 100 without increasing the size of the dies over that defined by the peripheral bond pads 110. A larger number of special contact pads may increase the number and/or complexity of tests that can be provided to the internal circuit, and thus may increase the fault coverage and robustness of tests” (Col. 5, ll. 17-23). This is contrary to the teachings of the present invention, that seeks to minimize the number of probe pads and to use each probe pad to test many different portions of functional circuitry.

Furthermore, claim 1 recites “allowing the respective portions of functional circuitry to be tested using the probe pad and without any contact of the plurality of bond pads by a probe needle.” Eldridge again clearly *teaches away* from this limitation. Eldridge teaches that the probes contact the bond pads in order to test the circuitry at col. 10, ll. 15-32 (one or more probe cards may be used to contact bond pads and/or probe pads). The present invention seeks to avoid contact of the bond pads, as seen in quotations provided below.

[0004] A probe card has multiple needles or pins that lie in a plane with a spacing or pitch between the pins. For the probe pins to make contact with the bonding pads, pressure must be exerted on the pins. If any of the pins is vertically misaligned, additional pressure must be exerted so that all of the pins make contact. The pressure of the pins contacting the surface of the die gouges the bonding pads. Furthermore, in a technique referred to as overdrive, probe pins are made to slide on the surface of the bonding pads in order to remove any aluminum oxide on the surface so that better contact can be achieved. This sliding action results in even larger gouges in the bond pads. Typically, to penetrate the oxide, the probe card and wafer are brought together until the needle probes contact the desired location. The probe card is then "overdriven" a distance which deflects the needle probes and causes them to bend. As the needle probes bend, the ends of the needle probes move horizontally across the bonding pads causing the ends to scrape the surface. This causes the ends to break through the native oxide layer and contact the underlying metal of the bonding pads. The scraping action also displaces some of the metal on the contact location causing a groove and a corresponding ridge.

[0005] The gouges in the bond pads resulting from even a single probing operation or “touchdown” weaken subsequent wire bonds to the bond pads. Multiple probing operations and any misalignment of the probe pins can result in severe damage to the bond pads and very poor wire bonding. For most integrated circuits, a wire is bonded to the pad after one or sometimes two touchdowns of the probe pins. However, memory testing may require several touchdowns of the probe pins for numerous reasons including laser repair and subsequent retest.

[0006] Small voids can form above the gouges created by one or more touchdowns. These voids between the bond pad and the bond wire create high stress points which may weaken and enlarge over time from thermal cycling, thus resulting in cracks which separate the bond wire from the bond pad.

Regarding claims 2 in the 35 USC §102 Claim Rejections, the Examiner stated “it appears that the multiplexing circuit (708) is the selector, it would have been obvious to a person having ordinary skill in the art at the time the invention replace the mutiplexing circuit by the plurality of switches.” Anticipation under 35 U.S.C. § 102 requires that each and every element of a claim be present in a single reference. Therefore this statement is in error as a matter of law, in as much as the Examiner has conceded that Eldridge does not disclose each limitation of claim 2. If the Examiner is arguing that claim 2 is invalid under 35 U.S.C. § 103, it is asserted that he has not made a prima facie case of obviousness regarding these claims.

Regarding claims 7-10 in the 35 USC §102 Claim Rejections, the Examiner stated “it appears that the probe pad would have been an obvious design choice to make the same size or larger as bond pad, and the probe pad is provided along one edge of the integrated circuit die, and the bond pads are provided at an opposing edge of the integrated circuit die (fig. 1).” Anticipation under 35 U.S.C. § 102 requires that each and every element of a claim be present in a single reference. Therefore this statement is in error as a matter of law, in as much as the Examiner has conceded that Eldridge does not disclose each limitation of claims 7-10. If the Examiner is arguing that the claims 7-10 are invalid under 35 U.S.C. § 103, it is asserted that he has not made a prima facie case of obviousness regarding these claims.

To establish a prima facie case of obviousness, three basic criteria must be met.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The initial burden is on the examiner. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). See MPEP § 2144 - § 2144.09 for examples of reasoning supporting obviousness rejections.

To the extent that the Examiner is alleging obviousness, he has failed to support his conclusions by simply stating that claim 2 is obvious and that claims 7-10 involve a design choice, without providing any evidence or convincing line of reasoning.

Allowable Subject Matter

The Examiner's indication that Claims 3-4 would be allowable if re-written in independent form is appreciated. Dependent claims 3 and 4 have been re-written in independent form to include the limitations of claim 1 from which they originally depended. No other limitations have been added. Therefore, newly independent claims 3 and 4 are allowable as originally written, and have not been amended in any narrowing fashion. Earliest issuance of these claims is hereby requested.

CONCLUSION

Applicant respectfully requests that the pending claims be allowed and the case passed to issue. Should the Examiner wish to discuss the Application, it is requested that the Examiner contact the undersigned at (415) 772-1200.

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Respectfully submitted,

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